

Utah Energy Forum

March 24, 2008

Draft notes

“Advanced Vehicles and Alternative Fuels”

Hosted by Idaho National Laboratory

Welcome and Introductions

- Idaho National Laboratory is a U.S. Department of Labor lab.
- Nuclear energy is 1/3 of our total budget, but we look at all aspects of energy and environment, including renewables, fossil fuels, conservation, and energy efficiency.
- This is a national lab, and we also do some international work. We are very interested in developing our natural resources in this region. It is an energy rich environment, including both fossil fuels and renewable energy in abundance. We do like to partner with the schools as well.
- Energy is a security risk. 60% of our oil and gas is imported. Our demand, and the world's demand for energy is increasing. We import oil from countries that are not stable or friendly to the U.S.
- Advanced Fuels and Vehicles not only decrease emissions, but also improve the efficiency of the vehicle. The highest concentration of hybrid vehicles has been released into Seattle, and we are currently doing research regarding integration factors and the effect on transportation.

Legislative Update, Dianne R. Nielson

- Focused on next steps in energy efficiency and promoting wise, sustainable energy. Diversifying energy portfolio for energy security.
- HB103 Sponsored by Representative Hunsaker. Use of State Alternative Fuel Network. 2nd most effective CNG Network. Easy access across the state from North to South. This targeted places where there was no commercial sites that allows the state to open up a facility to the public, with a small fee charged for the use.
- HB106 Sponsored by Representative McGee. Clean Air and Efficient Vehicle Tax Incentives. Provides tax credits from \$750 to \$2,500 for purchasing clean vehicles.
- HB146 Sponsored Representative Johnson. School Bus Amendments. Provided funds to match EPA grants for retrofitting old engines or for purchasing new cleaner school buses. Included no idle zones for everyone around schools. This was for the protection of school children and air quality.
- HB198 Sponsored by Representative Hunsaker. State Agency Energy Savings. Provides revolving loan from stripper well funds for state agency and higher education upgrades to meet energy efficiency standards.
- HB359(201) Sponsored by Representative Last. Was passed as HB201 and rolled into HB359. Provides a solar tax credit.
- SB84 Sponsored by Senator VanTassell. Net Metering Programs. Revised net metering regulations to increase project size and made net metering provisions easier to implement for renewable energy.

- SB202 Sponsored by Senator Bramble. Energy Resource and Carbon Emission Reduction Initiative. This was a Renewable Portfolio Standard 20% by 2025 target (not a mandate). This takes into account both cost effectiveness and other criteria when meeting the target so that we bring resources on in an effective manner. Starting in 2010 there will be a reporting requirement, continuing every 5 years.

Panel Presentations:

Tim Murphy, Idaho National Labs

- Energy Security
- Dept. of Energy National Lab Vehicle Technology Program
 - Deploy and test vehicle technologies including testing performance, economics, decrease in oil use
 - Both field testing and demonstrations
 - Analysis of techniques
- Current Vehicle Tech Program Testing
 - Hydrogen and ICE
 - EV & HEV
 - Plug-in HEV (PHEV)
 - Power Electronics
 - PHEV grid interaction
 - Fueling Infrastructure
 - Fuel Type Testing (ethanol and biodiesel planned)
 - Vehicle energy storage (Batteries and capacitors)
 - Heavy Vehicle Technology (plug-in hybrid buses)
- Main purpose is to quantify and benchmark development programs of DOE
 - The information/data is on the website for the public to see as well
 - Help fleet and vehicle purchasers make decisions (for State and Federal fleets) especially in regards to mandates
 - Work with a wide variety of partners
- Testing tailored to the program
 - Cost sharing
 - Various fleet testing
 - Accelerated testing
 - Baseline performance
 - End of life testing
- Testing Hydrogen
 - 100% blends
- Plug in Testing
 - Extended range plug in
 - Crash testing beginning
- Studying changing infrastructure
 - Energy needed
 - How often charging
 - Economics
- Smart grid testing PHEV

- Site evaluations
 - Economics
 - Infrastructure impact
- Vehicle energy storage
 - Batteries are the most effective way
 - RD&D Lithium Ion batteries
 - Advanced lead acid
 - Electrochemical capacitors, supercapacitors
- Testing Format
 - Testing
 - Analysis
 - Modeling
 - RD&D
- Freedom car technical teams
 - US Automakers with US Government representatives
- High power energy storage and data analysis
- Electrochemical performance modeling
 - INL advanced electrolyte model
- Washington State Plug In Hybrid Testing
 - Regional deployment
 - Study at its largest will include the whole state
 - Variety in transportation
 - How help DOT in lowering congestion
 - Grid, mileage, economics, emission
 - #1 goal is lowering energy dependence

Sam Lee, State Fleets

- 7 Factors for purchase decisions (weighted)
 - Cost Effectiveness (34%)
 - Energy Efficiency
 - Air Pollution (25%), and Greenhouse Gases (17%)
 - Decreasing oil dependence on foreign oil (7%)
 - Purchase requirements from federal government (7%)
 - American made vehicles (5%)
 - Refueling options for alternative fuel vehicles (12%)
- Purchase policy
 - Purchase light duty vehicles (excludes law enforcement)
 - Hybrid or Natural Gas vehicles
 - Air Quality score of 6 (www.fueleconomy.gov)
- Next 7-8 year focus on natural gas
 - Increasing hybrid vehicles
 - CNG vehicles, especially near refueling stations and campuses
 - Legislature allowed \$1.3 million to purchase hybrids
 - Fuel efficiency
- Alternative Fuels
 - Compressed Natural Gas (CNG)

- E85
 - Biodiesel (becoming standard fuel)
 - 141,000 gallons of B20 blend dispensed last year
 - Except places 30 degrees below temperature (fuel gelling)
- CNG fueling stations
 - 18 sites
 - 21,493 gallons dispensed last year
 - Now open to public in some places
 - Financial incentive
- E85 Fueling stations
 - 1 site
 - 1,185 gallons dispensed
- 20% increase in energy efficiency by 2015
 - Looking at several factors
 - Miles drives
 - Gallons of fuel used
 - Average miles per gallon
 - Average cost per mile
 - Number of vehicles by agency
 - HB110 passed in 2007
 - Standard replacement vehicle is now a compact sedan
 - Must justify any other type of vehicle to State fleets to authorize
 - 85 vehicles were downsized
 - Figured this equivalent of a net reduction of 76 vehicles from Fleets
- Future considerations
 - Dedicated electric truck
 - Plug in hybrids
 - Hydrogen fuel cells

Brent Singleton, Utah Clean Cities

- Utah Clean Cities has been around for 14+ years
 - Displaced more than a billion gallons of oil by 2005
- Alternative Fuel Stations in Utah
 - Biodiesel: 12
 - Ethanol-E85: 4
 - CNG Public: 21
 - CNG Private: 46 (some may be opening to public)
 - LPG: 26
 - Hydrogen: 0
 - Electric Charging Locations: 0
- 2008 alternative fuel vehicles in Utah (numbers from those bought directly from manufacturers)
 - B100 Vehicles: 174
 - CNG: 3,671
 - E85: 541

- LPG: 386
 - HEV (hybrid electric vehicle): 5,896
 - NEV (neighborhood electric vehicle): 2,050
 - Electric Vehicle: 236
- Grants Utah Clean Cities is engaged in:
 - Idle reduction education awareness for school district buses
 - Air quality in buses 4xs worse than outside
 - Air affected in schools
 - CNG infrastructure development grant
 - Partnership match for new public and private refueling stations
- www.utahcleancities.org

Hettie Fitzgerald, SemiService

- SemiService
 - As 2006 fuel costs skyrocketed, started studying alternative fuels
 - CNG reduced emissions and cut fuel costs significantly
 - Replaced company vehicles with CNG
 - Fuel costs went from thousands of dollars to hundreds
 - The two conversion companies went out of business and so started doing own conversions
- Conversions for several fleets planned
 - Fuel costs are around \$0.63/per gallon, compared to \$3.30 gasoline prices
 - New locations for fueling stations
 - Alternative fuel transportation and cleaner air quality
 - Extends life of engines
- Working to reduce cost of conversions
 - Looking at Plug and go systems
 - RD&D will help
 - Regional supply
 - Hoping to get an agreement for tanks soon
 - Working to make affordable for everyone

Questions and Answers:

- Is INL working with DOE Unconventional Fuels?
 - We work with fuels from synthetic processes & some from coals
 - All well known synthetic fuels
 - We work with all alternatives and types, don't pick favorites
- What is wrong with the current models of batteries?
 - Cost
 - Life and performance (15 year life)
 - Batteries don't react well to abuse
 - Looking at smaller cells, getting better and making huge advances
 - Pure electrics in cities, cheaper
 - Portfolio of fuels & batteries
- Hydrogen break down, is it ambient or blend?
 - Moving away from cryocompressed

- Best way through electrolysis then compressed
 - Storage is the number one problem
- What is the environmental aspect of INL?
 - Recyclability, fully recyclable
 - Emerging commercial technologies
 - Lithium in a very small amount and environmentally friendly
 - Need integrated system across the world
 - Also DOE group look at secondary uses
- To implement plug-in hybrids for all of the state of Utah what steps would need to be taken?
 - First, we would work with State Fleets
 - Look at bigger areas first
 - Secondly, DOE help with conversion and data analysis
 - Look at federal mandates
 - Still experimental cars
 - DOE wants to deploy more vehicles
 - Quantify potential
 - Last, work with car companies
- Are you looking at test vehicles in Boulder with the National Renewable Lab center there?
 - Yes, includes NREL in CO
 - More modeling/use scenarios
 - Other parts of program for data
- Are you looking at plug-in with decentralized energy?
 - Working with other labs
 - Energy that is being put into the grid
 - Idea of electricity highways, less being stored in the individual vehicle (way in the future)
 - WA state is looking at way to incorporate solar into the vehicle charge
- What about smart grid and MPG?
 - MPG averaging about 100 even to 120 per gallon
 - All electric range 10 or less
 - Want to go to 40 mile range
 - Smart grid: talking to the grid
 - This is very immature, still in paper stage
 - Interest is high
 - Have to have dedicated service
 - Smart grid can't see that small of vehicle, too small to big picture
- Hybrid versus CNG?
 - Carbon or NOx per mile driven
 - CNG is very clean
 - Hybrid can be worked with CNG sometimes
 - Hydrogen blends still have NOx
 - NOx is hard to get around. Some efficient vehicles have higher NOx from way the fuel is burned
 - Depends a lot on the fuels involved

- CNG or Hybrid both better than petroleum in terms of clean air
- Audience comment: CNG net better since burns no coal
- BTU range hard to predict
- Now getting a lot higher BTU
 - Range is supplied by Questar